

## **GENERAL REMARKS**

With the amendment above, Applicant has amended the Application in accordance with the Office Action. Applicant has corrected an error on page 18 pointed out in the Office Action, has cancelled claims with means-plus-function elements which Office Action did not consider well-defined by the specification and figures, and has removed references in the specification to the cancelled claims.

### **The Objection to Informality on Page 18 of the Specification**

The Office Action objected to an informality on the sixth line from the bottom of page 18, querying whether “the non-conjugated second moment” should read “the conjugated second moment”.

Applicant has corrected this to read “the conjugated second moment”, which is in accordance with the material in the associated paragraph and with the corresponding material in the claims.

Applicant therefore requests withdrawal of the objection to informality.

## **Claim Rejections Under 35 USC SS 112 Second Paragraph**

The Office Action rejected claim 1 and its dependent claims 2 through 9 as indefinite under 35 USC SS 112. In particular, claim 1 included language specifying “means for periodic selection of a symbol from said first symbol constellation” and “means for periodic selection of a symbol from said second constellation”. The Office Action interpreted these as “means plus function” limitations but cited a lack of support in the specification and drawings for the presence of these features.

### **Figures did not include details of means-plus-function elements**

Applicant concedes that the figures did not include means-plus-function elements cited in original claims 1-9.

### **Re: Claim 1 - Paragraph 2 on Page 18 discusses “means for periodic selection”**

Paragraph 2 on page 18 of the original application is presented in its entirety below:

Fig 2C shows a third sequence of symbol constellations which is a preferred embodiment of the present invention. With reference to claim 1, the sequence consists of a first constellation and a second constellation, with means for periodically selecting symbols from each. The means for selecting symbols can be a map between data values and the symbols, with the map changed according to the desired constellation at each index value. In the figure, the first

constellation is used at index  $n$  and at index  $n+2$ , while the second constellation is used at index  $n+1$  and at index  $n+3$ .

This paragraph directly discusses claim 1 of the original application with respect to the constellation sequence depicted in Fig. 2C. The “first constellation” and the “second constellation” in claim 1 are clearly identified as the constellation used at indices  $n$  and  $n+2$  and the constellation used at indices  $n+1$  and  $n+3$  respectively, with periodic use illustrated by the figure and mentioned explicitly in subsequent discussion (page 19, lines 23-24). A possible “means for periodic selection” is mentioned specifically in the quoted paragraph, namely “a map between data values and the symbols...changed according to the desired constellation at each index value”.

While a particular map was not given, mapping data to symbols is a standard part of communications system design, with possible implementations including look-up tables, software case statements, phase shifters (for constant-modulus constellations), in-phase and quadrature multipliers, and other techniques well known from the prior art.

Applicant submits that one with ordinary skill in the art would be able to design a system with periodic selection of symbols from different constellations at different indices quite easily. However, Applicant (a *pro se* filer) defers to the Office Action on interpretation of whether or not “a map between data values and symbols...changed according to the desired constellation at each index value” constitutes sufficient definition of the means-plus-function elements of original claim 1, and has cancelled original claim 1.

**Re: Claims 2-9 – Means-plus-function elements discussed in the specification but not enumerated**

Applicant included extensive discussion of linear channel parameter estimation (related to claims 2 and 6), linear channel equalizer parameter estimation (related to claims 3 and 7), nonlinear channel parameter estimation (related to claims 4 and 8), and nonlinear channel equalizer parameter estimation (related to claims 5 and 9) in the specification, mainly by reference to prior art (e.g. the paragraphs on page 20 lines 6-12, on page 24 lines 6-13, and elsewhere).

Channel parameter estimation and equalizer parameter estimation are well-known in the prior art, and in the blind context rely on knowing a sequence of input statistics – but not the actual input symbols – and measuring a sequence of output statistics.

Subsequently, the output statistics are processed to restore the statistical properties of the inputs, allowing recovery of the actual input symbols. Applicant submits that, insofar as no prior art input statistic sequences have had cyclostationary non-conjugated second moments (in fact, they have all had stationary zero-valued non-conjugated second moments), any channel estimator or equalizer using cyclostationary non-conjugated second moments given the constellation limitations of the claims should be covered by the means-plus-function elements in the original machine claims.

Notwithstanding, Applicant did not enumerate or discuss the possible means-plus-function elements in the specification sufficiently, according to the Office Action.

Applicant defers to the Office Action and has cancelled claims 2-9 in addition to canceling claim 1.

**Applicant has cancelled claims objected to under 35 USC 112**

Applicant has cancelled all 9 claims objected to under 35 USC 112 paragraph 6 as having means-plus-function elements which were not properly supported in the specification and the figures. Applicant has also removed references to the canceled claims from the specification.

### **Prior Art Made of Record and not relied upon**

The Office Action cited U.S. Patent 6,463,099 entitled BLIND CHANNEL EQUALIZERS AND METHODS OF BLIND CHANNEL EQUALIZATION and issued to X. Cao, Z. Ding, and J. Zhu on October 8, 2002 as prior art made of record and not relied upon.

This prior art patent discusses blind channel equalization in MIMO systems (i.e. with multiple transmitter antennas and multiple receiver antennas), notably second-order statistical techniques based on the auto-covariance (a conjugated second-order moment – see column 8 line 11 of Cao). Otherwise, the patent includes a fairly comprehensive discussion of some well-known general techniques for data recovery, including zero-forcing linear filters and maximum-likelihood sequence estimators. Issues of knowing the FIR channel length (e.g.  $M$ ) are discussed in column 9 of Cao.

Interestingly, all second-order statistical approaches using conjugated second-order statistics suffer from a noise floor caused by non-zero conjugated second order statistics of noise, typically of additive white Gaussian noise (AWGN). In contrast, in spite of the similarities of the present invention to the prior art – in other words, cyclostationary non-conjugated second-order moment sequences analogous to cyclostationary conjugated second-order moment sequences in the prior art, and subject to similar effects from the linear portion of the channel model – the noise typically has identically zero non-conjugated second-order statistics. This means that blind equalization or channel identification techniques based on the present invention are not noise limited insofar as the effects of the noise become arbitrarily small with a large enough set of channel outputs contributing to each measured statistic.

## Conclusion

For all the above reasons, the Applicant submits that the specification and the claims are now in proper form, and that the claims are all patentable over the prior art. Therefore, the Applicant submits that this application is now in condition for allowance, which action is respectfully solicited.

## Conditional Request for Constructive Assistance

The Applicant has amended the specification and claims of this application so that they are proper, definite, and define novel structure which is also unobvious. If, for any reason this application is not believed to be in full condition for allowance, the Applicant, an independent inventor and pro se filer, respectfully requests the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P SS 2173.02 and SS 707.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very Respectfully,



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